

Examiner.

FIG. 9 has been canceled in answer to the examiner's requirements concerning text description and component identification.

The specification has been reviewed and revised to correct grammatical errors that were found. Specific corrections are included in the amendments above.

Applicant has received a non-statutory double patenting rejection with respect to the claims 1-10. Applicant is filing a terminal disclaimer to assure that the patents resulting from this application expire on the same date as US patent 5,303,138. The claims of this application differ from the (138) patent in redefining the connection of energy to the output in terms of circulating energy as opposed to connecting the secondary to the output. This is a concept disclosed in the (138) patent but not claimed.

All claims 1-10 have been rejected. Claims 1 - 5 are rejected under 35 U.S.C. § 103 as being unpatentable over Bassett (U.S. Patent 5,066,900) in view of Principles of Solid State Power Conversion Tarter 1st ed., 1985, Pg. 544-547. Claims 5 - 10 are rejected under 35 U.S.C. § 103 as being unpatentable over Bassett (U.S. Patent 5,066,900) in view of Principles of Solid State Power Conversion Tarter 1st ed., 1985, Pg. 544-547, and further in view of Jitaru (U.S. Patent 5,126,931).

At its core the rejection posits that synchronous rectification may be combined with a clamped primary circuit in a power converter. At the filing date of applicant's application this combination had not been disclosed in the published art. What applicant recognized and the others have not is that the clamped mode primary extended the drive for the synchronous rectifiers and made the combination desirable rather than just possible. The failure of others at the time to realize this fact indicates the extent to which applicant has advanced the art.

Applicant has disclosed an invention in which a clamped mode power train, in the primary circuit, is combined with self driven synchronous rectifiers in the secondary circuit; wherein the clamped primary, in combination with the isolation transformer, advantageously maintains the drive voltage at a constant during substantially the entire non-power conducting switching interval. This voltage clamping limits the peak voltage and extends the duration of a voltage sufficient in amplitude to provide a continuous drive to the synchronous rectifiers that obviates the need for a separate circuit controlled drive to the synchronous rectifiers that is intended to reduce the voltage drop. Reduction of the voltage drop across the rectifying device is not applicant's objective; providing a continuous drive with a clamped primary is. This continuous drive permits an economical drive that obviates the need for complex drive circuitry.

The Bassett reference discloses a two switch converter with zero-voltage switching through the use of resonant circuitry. Bassett teaches the use of the transformer magnetizing inductance to discharge parasitic capacitances of the switching devices. The problem addressed by Bassett, in his patent, is that in the prior art clamped mode forward converter of Fig. 2A, zero voltage switching of Q3 cannot be achieved. His invention is directed to solving this problem by changing the transformer winding orientation to that in Fig. 5. Bassett does not disclose the use of synchronous rectifiers, nor does he teach the application of the transformer waveform of a clamped mode primary circuit to achieve a continuous voltage waveform drive so desirable in driving the synchronous rectifiers. The nature and operation of the primary circuit is such that the voltage across the transformer is continuously high as is the case in applicant's circuit. But no teaching exists as to the application of this effect to enhance synchronous rectification drive. This reference fails to provide the necessary teaching to inspire those skilled in the art to combine the clamped primary with synchronous rectifiers. This is readily evident from teachings of the cited prior art which predate applicant's filing date.

The disclosure of the Tartar reference teaches the use of synchronous rectifiers to achieve a reduction in voltage drop as compared with more conventional rectifier devices. The nature of the driving primary circuit, which is critical to applicant's invention, is not disclosed. Hence there can be no teaching concerning the combination of the clamped mode primary with synchronous rectification to achieve superior drive to the synchronous rectifiers.

Jitaru is concerned with another circuit objective which is to enhance zero-voltage switching of the power switches by disconnecting the secondary at critical times in the switching of the power switches so that resonant energy discharging the parasitic capacitances is not transferred to the secondary circuit. While a clamping circuit is disclosed it would not permit the use of synchronous rectifiers since the circuitry to disconnect the secondary would defeat its use for this purpose.

To combine the Bassett and Tartar references, according to their teachings, is to create an aggregation with a zero-voltage switching primary circuit and a secondary circuit using synchronous rectifiers with an objective to achieve zero voltage switching and reduce the voltage drop across the rectifying devices. The combination does not teach any synergy in the overall circuit to combine a clamped primary circuit with synchronous rectification in the secondary circuit, such as that taught by applicant. The disclosure of a clamping circuit in Jitaru does not combine with the other two references because Jitaru is not suggestive of using the clamping for supporting the driving of synchronous rectifiers due to disconnection of the secondary each half cycle in the Jitaru circuit. In an obviousness rejection the combined references must provide a teaching pointing the

inventive combination. Here there is no such teaching. Applicant's circuit is not concerned with discharging of parasitic capacitances, in fact such concern with discharging these parasitic capacitances would be disadvantageous to the synchronous gate charging and discharging in driving the synchronous rectifier devices. This is clearly indicative of the fact that the Bassett and Jitaru references are not a starting point in conceiving the invention of applicant's circuit.

The claims have been amended to provide recitations that very clearly define applicant's invention and distinguish the cited references as an obvious combination and also singly as sole references.

For example amended claims 1 and 2 now recite "--clamping means for limiting a voltage and extending the voltage's duration across the secondary winding at a substantially constant amplitude during substantially an entire extent of a clamping interval"--

Amended claim 5 recites "-- constant amplitude--duration--a constant voltage for substantially its entire extent--"

Support for these recitations may be found in the recitation of the invention in the summary of the invention portion of the specification.

This application is now believed to be in condition for allowance and the same is respectfully solicited.

Respectfully,  
Allen Frank Rozman

By Alfred G. Steinmetz  
Alfred G. Steinmetz, Attorney  
Reg. No. 22971  
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AT&T Bell Laboratories

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